

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>A61N 5/01, 5/06</b>		A1	(11) International Publication Number: <b>WO 00/43068</b> (43) International Publication Date: <b>27 July 2000 (27.07.00)</b>
(21) International Application Number: <b>PCT/SE00/00107</b> (22) International Filing Date: <b>19 January 2000 (19.01.00)</b> (30) Priority Data: <b>9900160-4</b> <b>20 January 1999 (20.01.99)</b> <b>SE</b> (71) Applicant (for all designated States except US): <b>BIOLIGHT PATENT HOLDING AB [SE/SE]; Svärdvägen 15, S-182 33 Danderyd (SE).</b> (72) Inventor; and (75) Inventor/Applicant (for US only): <b>THIBERG, Rolf [SE/SE]; Åkersbergavägen 10, S-184 50 Åkersberga (SE).</b> (74) Agents: <b>ÖRTENBLAD, Bertil et al.; Noréns Patentbyrå Ab, Box 10198, S-100 55 Stockholm (SE).</b>		(81) Designated States: <b>AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</b>  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Swedish).</i>	
(54) Title: <b>MEANS FOR EXTERNAL MEDICAL TREATMENT BY MEANS OF LIGHT</b>			
(57) Abstract <p>Apparatus for external medical treatment with the aid of light, said apparatus comprising a light emitting device (1) which is intended to be held against or in the close proximity of a patient's body, and means (8, 9, 10) for driving the light emitting device, wherein said light emitting device includes light emitting diodes or corresponding elements adapted to emit monochromatic light, wherein the drive means (8, 9, 10) is adapted to control the light emitting device (1) to emit one or more types of monochromatic light over one or ore more predetermined time periods and to pulsate said emitted light in accordance with a predetermined pulse frequency or a series of pulse frequency over said time periods, and wherein said light emitting device (1) includes a casing (15) and a plate (16) that carries said light emitting diodes. The inventive apparatus is characterised by an electric motor (17) which is fixedly mounted in relation to said casing (15) and which is connected to said plate (16) via a drive shaft (18), whereby the plate (16) with the light emitting diodes (3, 4) is adapted to perform a rotary movement.</p>			

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

**MEANS FOR EXTERNAL MEDICAL TREATMENT BY MEANS OF LIGHT**

The present invention relates to an apparatus for external medical treatment with the aid of light, more specifically with the aid of light which palliates and/or cures different states of diseases.

Swedish Patent Specification No. 502 784 teaches for example an apparatus for external medical treatment with the aid of light that includes a light emitting device which is intended to be held against or close to the body of an individual, and drive means for the light emitting device, which light emitting device includes light emitting diodes or corresponding elements which is intended to emit infrared light. According to the aforesaid patent specification, the means for driving the light emitting device is adapted to control said device to emit infrared light in a first stage over a first predetermined time period and then to emit visible light in a second stage over a second predetermined time period, wherein said drive means is adapted to pulsate the infrared light and the visible light in accordance with a predetermined series of pulse frequencies.

It is also known to emit other types of monochromatic light for treating different states of diseases.

It has also been found that very good results can be obtained when treating a patient with solely one or more types of monochromatic light and with light other than infrared light, such as visible light of different colours emitted in accordance with a given pulse frequency.

It has been found that an apparatus of the aforesaid kind can be used very successfully for treating many different states

of diseases and injuries, for instance sport sustained injuries, stretched muscles, muscular pain, joint pain, headaches, various inflammatory conditions, various skin complaints, such as acne, back pains, etc., provided that the  
5 light is emitted in a certain way. In this regard, treatment with light has a favourable influence on injury healing processes and will palliate and/or cure various diseases.

There is thus an understanding that treatment with certain  
10 light that is emitted in certain frequency series will have a significantly greater effect in shortening the time taken to cure or palliate a disease.

One problem with devices of this kind known hitherto is that  
15 the person administering the treatment is required to oscillate the light emitting device whilst holding the device against or in the close proximity of that region of the patient's body to be treated. The reason for this is because the light emitting diodes disposed at the bottom of the light  
20 emitting device have a given geometric extension and are of different kinds, and hence two mutually adjacent light emitting diodes of mutually the same kind will be spaced at a certain distance apart. It is therefore necessary to move the light emitting device forwards and backwards over the area to  
25 be treated, in order to ensure that the whole of said area will be irradiated uniformly to the best possible extent.

Because treatment of this kind will usually take from two to ten minutes to carry out, frequent administration of the  
30 treatment administered may be very onerous to the person concerned.

This problem is solved by the present invention.

Thus, the present invention relates to an apparatus which is intended for external medical treatment with the aid of light and which includes a light emitting device that is intended to lie against or be held in the close proximity of the patient's body, and drive means for the light emitting device, wherein the light emitting device includes light emitting diodes or corresponding elements which are adapted to emit monochromatic light, wherein the means that drives said device is adapted to control the light emitting device to emit one or more types of monochromatic light over one or more predetermined time periods and to pulsate said emitted light in accordance with a predetermined pulse frequency or series of pulse frequencies over said time periods, and wherein the light emitting device includes a casing and a light-emitting-diode supporting plate, said apparatus being characterised by an electric motor which is fixed in relation to said casing and connected to said plate via a drive shaft, whereby the plate carrying the light emitting diodes performs a rotary movement.

20

The invention will now be described in more detail partly with reference to an exemplifying embodiment thereof shown on the accompanying drawings, in which

- Figure 1 is a schematic block diagram illustrating an apparatus of the aforesaid kind;
- Figure 2 is a side view of a light emitting device;
- Figure 3 shows an inventive light emitting device from beneath; and
- Figure 4 is a cross-sectional view of the inventive light emitting device.

30

Figures 1 and 2 illustrate generally an apparatus for external medical treatment with the aid of light, said apparatus including a light emitting device 1 which is

intended to be held against or in the close proximity of the patient's body. The light emitting device is shown from one side in Figure 2 and from beneath in Figure 1. This device 1 includes a casing 5 which houses a transparent plate 6. Located beneath the plate 6 is a surface 2 on which a plurality of light emitting diodes 3, 4 or corresponding elements are mounted.

The light emitting diodes thus emit light through the plate 6 when energised, i.e. when supplied with current through a cable 7.

When the device is being used, the casing 5 is held so that the plate 6 will lie against the relevant part of the patient's body.

The apparatus also includes drive means for the light emitting device 1. The drive means is adapted to control the light emitting device 1 to emit different monochromatic light of different wavelengths over different predetermined time periods, and to pulsate the light emitted in accordance with a predetermined pulse frequency or series of pulse frequencies over said time periods.

The light emitting device 1 may include light emitting diodes 3 adapted for the emission of infrared light. These diodes are shown with solid circles in Figure 1. Visible light can be emitted with the aid of other light emitting diodes 4. These diodes are illustrated with empty circles in Figure 1. The infrared light diodes 3 will preferably be semiconductors of the GaAs-type (Gallium Arsenide). The diodes 4 that emit visible light will also preferably be of the GaAs-type.

The drive means includes a computer 8 which controls drive circuits 9, 10 to which signals for driving the light emitting diodes are sent from the computer via conductor 7.

5 The computer and the drive circuits are of a suitable known kind. The drive means or computer has connected thereto a keyboard 13 by means of which the operator can key-in data for causing the drive means to activate the light emitting device in a desired manner. The device will conveniently also  
10 include a display 14 for displaying the settings entered through the keyboard. This display may be the computer screen.

The light emitting device 1 includes light emitting diodes 4  
15 which are adapted to emit essentially monochromatic visible light in one of the colours violet, blue, yellow, orange, red or green, and also infrared light and other invisible wavelengths.

20 The nature of the light used will depend on the disease or the type of injury to be treated.

A large part of the above description of the drawings is also found in the aforementioned patent specification.

25 According to the present invention, the light emitting device 1 includes a casing 15 and a plate 16 that carries the light emitting diodes 3, 4.

30 In accordance with the present invention the apparatus includes an electric motor 17 that is fixedly mounted relative to the casing 15 and which is connected to said plate 16 via a drive shaft 18, whereby the plate 16 carrying

the light emitting diodes 3, 4 will perform a rotary movement relative to the casing 15 when the motor is running.

5 The various light emitting diodes will therefore be moved forwards over the area of the body to be treated and will provide totally uniform irradiation of said area without the person administering the treatment needing to move the apparatus forwards and backwards over said area.

10 According to one preferred embodiment of the invention, the light emitting diodes are mounted on said plate 16 around concentric circles relative to the drive shaft 18, as illustrated in Figure 3, where each dot 19 denotes the location of a light emitting diode. The diodes disposed  
15 around a circle on the plate may either be of one and the same kind, or diodes of one and the same kind may be placed radially outwards from the centre 20 of the plate.

20 According to one alternative embodiment, the light emitting diodes are mounted on the plate 16 around a helical line in relation to the drive shaft 18, i.e. from the centre of the plate and radially out towards the plate periphery.

25 According to one preferred embodiment, the plate 16 is rotated at a speed of about 1 to 200 r.p.m. The motor 17 is preferably a stepping motor. The motor may also be constructed for rotation in both directions.

30 According to another preferred embodiment, the electric motor 17 is a variable speed motor. To this end, an appropriate known control circuit 21 may be fitted in the casing 15. An outwardly projecting knob 22 may be provided for finger adjustment of the motor speed.



In Figure 4, the reference 23 identifies an input for an electric cable for driving the motor and the light emitting diodes. The control circuit may be included in said drive means 8, 9, 10. In this case, the motor may be activated via  
5 the cable, therewith obviating the need for a separate control circuit 21 in the light emitting device 1. The motor speed may be keyed-in on the key pad 13.

It will be obvious that the present invention solves the  
10 problem mentioned in the introduction.

The invention has been described above with reference to certain embodiments thereof.

15 It will, however, be understood that the present invention is not restricted to these embodiments but that variations can be made within the scope of the accompanying Claims.

## CLAIMS

1. Apparatus for external medical treatment with the aid of light, said apparatus comprising a light emitting device (1) which is intended to be held against or in the close proximity of a patient's body, and means (8, 9, 10) for driving the light emitting device, wherein said light emitting device includes light emitting diodes or corresponding elements adapted to emit monochromatic light, wherein the drive means (8, 9, 10) is adapted to control the light emitting device (1) to emit one or more types of monochromatic light over one or more predetermined time periods and to pulsate said emitted light in accordance with a predetermined pulse frequency or a series of pulse frequency over said time periods; and wherein said light emitting device (1) includes a casing (15) and a plate (16) that carries said light emitting diodes, characterised by an electric motor (17) which is fixedly mounted in relation to said casing (15) and which is connected to said plate (16) via a drive shaft (18), whereby the plate (16) with the light emitting diodes (3, 4) is adapted to perform a rotary movement.
2. Apparatus according to Claim 1, characterised in that the light emitting diodes are mounted on said plate (16) around circles that are concentric with the drive shaft (18).
3. Apparatus according to Claim 1, characterised in that the light emitting diodes are mounted on said plate (16) around a helical line relative to the drive shaft (18).

4. Apparatus according to Claim 1, 2 or 3, characterised in that the drive device (17) is driven at a speed of about 1 to 200 r.p.m.
- 5 5. Apparatus according to Claim 1, 2, 3 or 4, characterised in that the electric motor (17) is a variable speed motor.

Fig. 1

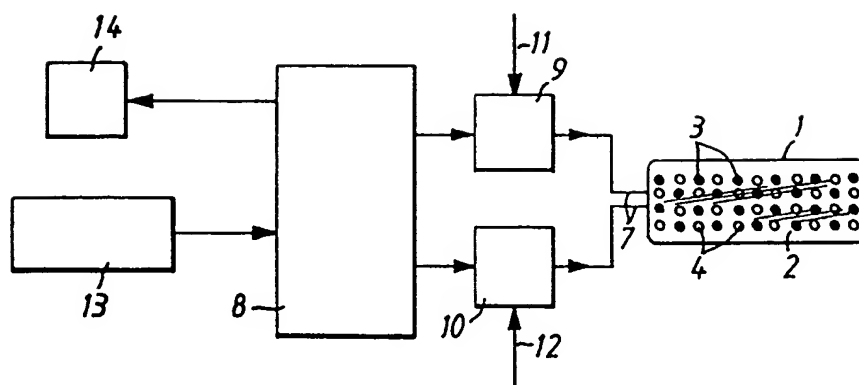


Fig. 2

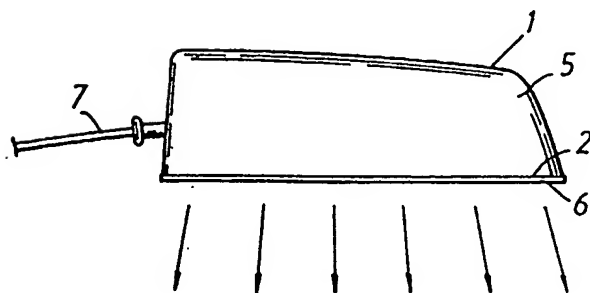


Fig. 3

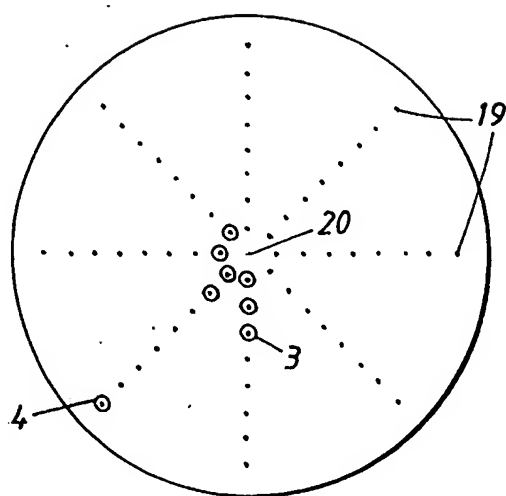
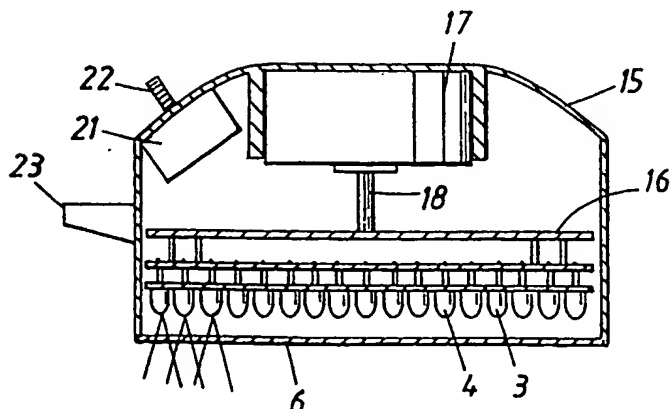


Fig. 4



SUBSTITUTE SHEET (RULE 26)

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 00/00107

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61N 5/01, A61N 5/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SE 502784 C2 (BIOLIGHT PATENT HOLDING AB), 15 January 1996 (15.01.96), abstract  --	1-5
A	FR 2731357 A1 (STE FRANCAISE DES TECHNOLOGIES ROBOTIQUES SOCIETE A RESPONSABILITE LIMITEE), 13 Sept 1996 (13.09.96), see the whole document  --	1-5
A	AT 305489 B (LEOPOLD HASAN), 26 February 1973 (26.02.73), see the whole document  -- -----	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

- \* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier document but published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - "O" document referring to an oral disclosure, use, exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed
  - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  - "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  - "&" document member of the same patent family

Date of the actual completion of the international search

22 May 2000

Date of mailing of the international search report

29-05-2000

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Nikolaj Hautaviita/AE  
Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/SE 00/00107**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 502784 C2	15/01/96	AU 1549595 A	08/08/95
		CA 2181345 A	27/07/95
		CN 1138830 A	25/12/96
		EP 0740568 A	06/11/96
		JP 9508032 T	19/08/97
		SE 9402679 A	21/07/95
		US 5800479 A	01/09/98
		WO 9519810 A	27/07/95
		AU 1549495 A	08/08/95
		AU 6160094 A	14/09/94
		BR 9406091 A	12/12/95
		CA 2181346 A	27/07/95
		CN 1138831 A	25/12/96
		EP 0686145 A	13/12/95
		EP 0740567 A	06/11/96
		FI 954017 A	25/08/95
		JP 8509468 T	08/10/96
		JP 9508031 T	19/08/97
		NO 953333 A	24/08/95
		PL 310399 A	11/12/95
		SE 504298 C	23/12/96
		SE 9400153 A	21/07/95
		SK 97095 A	01/10/96
		US 5766233 A	16/06/98
		US 5883129 A	16/03/99
		WO 9519809 A	27/07/95
-----			
FR 2731357 A1	13/09/96	NONE	
-----			
AT 305489 B	26/02/73	NONE	
-----			